

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re application of:        Christophe Pierrat et al.

Application No.:    filed Herewith

Parent Appln. Group No.: 1756

Filed:                9/9/2003

Parent Appln. Examiner: Stephen D. Rosasco

For: "Structure And Method Of Correcting Proximity Effects In A Tri-Tone Attenuated Phase-Shifting Mask"

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Date: September 9, 2003

**INFORMATION DISCLOSURE STATEMENT**

**List of Sections Forming Part of This Information Disclosure Statement**

The following sections are being submitted for this Information Disclosure Statement:

1. Identification of Prior Application in Which Listed Information Was Already Cited and for Which No Copies Are Submitted or Need Be Submitted

**Section 1.        Identification of Prior Application in Which Listed Information Was Already Cited and for Which No Copies Are Submitted or Need Be Submitted**

This application relies, under 35 U.S.C. § 120, on the earlier filing date of prior application Serial No.: 09/746,369, filed on December 20, 2000, now allowed (U.S. Patent Number not yet known).

Copies of the documents listed on the accompanying Form PTO-1449 (22 pages) that are not enclosed were previously submitted in Application No. 09/746,369, from which this Application claims an earlier effective filing date.

Applicants respectfully request that the listed information be considered by the Examiner and be made of record in the above-identified application. If form PTO-1449 is enclosed, the Examiner is requested to initial and return it in accordance with MPEP § 609.

This statement is not intended to represent that a search has been made or that the information cited in the statement is, or is considered to be, material to patentability as defined in 37 C.F.R. § 1.56.


☒ This statement qualifies under 37 C.F.R. § 1.97, subsection (b) because (check all that apply):

- ☒ (1) It is being filed within 3 months of the application filing date and is other than a continued prosecution application under § 1.53(d)  
-- OR --
- ☐ (2) It is being filed within 3 months of entry of a national stage  
-- OR --
- ☐ (3) It is being filed before the mail date of the first Office Action on the merits.  
-- OR --
- ☐ (4) It is being filed before the mailing of a first Office Action after the filing of a request for continued examination under § 1.114

SN: filed herewith

- ☐ 37 C.F.R. § 1.97(c). If this statement is being filed after the period specified in § 1.97(b), but before the mailing date of the earlier of a final office action under § 1.113, a notice of allowance under § 1.311, or an action that otherwise closes prosecution in the application, then:
- ☐ a certification as specified in § 1.97(e) is provided below; **or**
- ☐ a fee of \$180.00 as set forth in § 1.17(p) is authorized below, enclosed, or included with the payment of other papers filed together with this statement.
- ☐ 37 C.F.R. § 1.97(d). If this statement is being filed after the period specified in § 1.97(c), but on or before payment of the issue fee, then:
- A. a certification as specified in § 1.97(e) is completed below; **and**
- B. a fee of \$180.00 as set forth in § 1.17(p) is authorized below, enclosed, or included with the payment of other papers filed together with this statement.
- ☒ *Fee Authorization.* Applicant believes NO fee is due. However, in the event a fee is found to be due, the Commissioner is hereby authorized to charge Deposit Account No. 50-0574 (Docket No. NTI-007-1D).

Date: 9-9-03



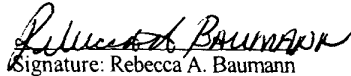
Signature of Practitioner

Jeanette S. Harms, Reg. No. 35,537  
Bever, Hoffman & Harms, LLP

Tel. No.: 1-408-451-5907  
Customer No.: 29477

I hereby certify that this correspondence is being deposited with the United States Postal Service as EXPRESS MAIL, Label No: EV 338 032 893 US addressed to: Mail Stop Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA, 22313-1450.

9/9/03  
Date



Signature: Rebecca A. Baumann

|                                                                               |                                                                                                                                                     |                               |                 |                |          |                          |                          |
|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------|----------------|----------|--------------------------|--------------------------|
| <b>INFORMATION DISCLOSURE<br/>CITATION</b><br><br><b>PTO-1449</b>             |                                                                                                                                                     | ATTY. DOCKET NO.              |                 | SERIAL NO.     |          |                          |                          |
|                                                                               |                                                                                                                                                     | NTI-007-1D                    |                 | Filed Herewith |          |                          |                          |
|                                                                               |                                                                                                                                                     | APPLICANT: Christophe Pierrat |                 |                |          |                          |                          |
|                                                                               |                                                                                                                                                     | FILING DATE: 9/9/2003         |                 | GROUP: unknown |          |                          |                          |
| <b>U.S. PATENT DOCUMENTS</b>                                                  |                                                                                                                                                     |                               |                 |                |          |                          |                          |
| EXAMINER'S<br>INITIALS                                                        | PATENT NO.                                                                                                                                          | DATE                          | NAME            | CLASS          | SUBCLASS | FILING DATE              |                          |
|                                                                               | 5,503,951                                                                                                                                           | 04/02/1996                    | Flanders et al. | 430            |          | 04/17/1995               |                          |
|                                                                               | 5,565,286                                                                                                                                           | 10/15/1996                    | Lin             | 430            |          | 11/17/1994               |                          |
|                                                                               | 5,725,969                                                                                                                                           | 03/10/1998                    | Lee             | 430            |          | 12/22/1995               |                          |
|                                                                               | 6,004,702                                                                                                                                           | 12/21/1999                    | Lin             | 430            |          | 05/21/1998               |                          |
|                                                                               | 6,010,807                                                                                                                                           | 01/04/2000                    | Lin             | 430            |          | 04/07/1998               |                          |
|                                                                               | 4,890,309                                                                                                                                           | 12/26/1989                    | Smith, et al.   | 378            | 35       | 02/25/1987               |                          |
|                                                                               | 5,288,569                                                                                                                                           | 2/22/1994                     | Lin             | 430            | 5        | 4/23/1992                |                          |
|                                                                               | 6,312,854 B1                                                                                                                                        | 11/6/2001                     | Chen, et al.    | 430            | 5        | 3/16/1999                |                          |
|                                                                               |                                                                                                                                                     |                               |                 |                |          |                          |                          |
| <b>FOREIGN PATENT DOCUMENTS</b>                                               |                                                                                                                                                     |                               |                 |                |          |                          |                          |
| EXAMINER'S<br>INITIALS                                                        | PATENT NO.                                                                                                                                          | DATE                          | COUNTRY         | CLASS          | SUBCLASS | TRANSLATION              |                          |
|                                                                               |                                                                                                                                                     |                               |                 |                |          | YES                      | NO                       |
|                                                                               | WO 97/45772                                                                                                                                         | 12/4/1997                     | WO              |                |          | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                               | WO 98/38549                                                                                                                                         | 9/3/1998                      | WO              |                |          | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                               | WO /99/27420                                                                                                                                        | 6/3/1999                      | WO              |                |          | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                               | WO 99/47981                                                                                                                                         | 9/23/1999                     | WO              |                |          | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                               |                                                                                                                                                     |                               |                 |                |          | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)</b> |                                                                                                                                                     |                               |                 |                |          |                          |                          |
|                                                                               | Wong, A., et al., "Deep-UV Lithographic Approaches for 1Gb DRAM", 1997 Symposium on VLSI Technology Digest of Technical Papers, pp. 127-128 (1997). |                               |                 |                |          |                          |                          |
|                                                                               | Chen, J. Fung, et al., "High-T, Ternary Attenuating PSMs for the 130nm Node", Microlithography World \, pp. 12, 14, 16, 18, 20 & 30 (2000).         |                               |                 |                |          |                          |                          |
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| EXAMINER                                                                      |                                                                                                                                                     |                               | DATE CONSIDERED |                |          |                          |                          |

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

|                                                                   |            |          |                           |       |                |             |
|-------------------------------------------------------------------|------------|----------|---------------------------|-------|----------------|-------------|
| <b>INFORMATION DISCLOSURE<br/>CITATION</b><br><br><b>PTO-1449</b> |            |          | ATTY. DOCKET NO.          |       | SERIAL NO.     |             |
|                                                                   |            |          | NTI-007-1D                |       | Filed Herewith |             |
|                                                                   |            |          | APPLICANT Pierrat, et al. |       |                |             |
|                                                                   |            |          | FILING DATE 9/9/2003      |       | GROUP unknown  |             |
| <b>U.S. PATENT DOCUMENTS</b>                                      |            |          |                           |       |                |             |
| EXAMINER'S<br>INITIALS                                            | PATENT NO. | DATE     | NAME                      | CLASS | SUBCLASS       | FILING DATE |
|                                                                   | 4,231,811  | 11/4/80  | Somekh, et al.            | 148   | 1.5            | 9/13/79     |
|                                                                   | 4,456,371  | 6/26/84  | Lin                       | 355   | 71             | 6/30/82     |
|                                                                   | 4,812,962  | 3/14/89  | Witt                      | 364   | 490            | 4/9/87      |
|                                                                   | 4,902,899  | 2/20/90  | Lin, et al.               | 250   | 492.1          | 6/1/87      |
|                                                                   | 5,051,598  | 9/24/91  | Ashton, et al.            | 250   | 492.2          | 9/12/90     |
|                                                                   | 5,182,718  | 1/26/93  | Harafuji, et al.          | 364   | 490            | 3/29/90     |
|                                                                   | 5,241,185  | 8/31/93  | Meiri, et al.             | 250   | 492.2          | 1/8/92      |
|                                                                   | 5,242,770  | 9/7/93   | Chen, et al.              | 430   | 5              | 1/16/92     |
|                                                                   | 5,256,505  | 10/26/93 | Chen, et al.              | 430   | 5              | 8/21/92     |
|                                                                   | 5,302,477  | 4/12/94  | Dao, et al.               | 430   | 5              | 8/21/92     |
|                                                                   | 5,308,741  | 5/3/94   | Kemp                      | 430   | 312            | 7/31/92     |
|                                                                   | 5,316,878  | 5/31/94  | Saito, et al.             | 430   | 5              | 6/4/92      |
|                                                                   | 5,328,807  | 7/12/94  | Tanaka, et al.            | 430   | 311            | 6/7/91      |
|                                                                   | 5,340,700  | 8/23/94  | Chen, et al.              | 430   | 312            | 11/3/93     |
|                                                                   | 5,352,550  | 10/4/94  | Okamoto                   | 430   | 5              | 4/23/93     |
|                                                                   | 5,364,716  | 11/15/94 | Nakagawa, et al.          | 430   | 5              | 9/3/92      |
|                                                                   | 5,424,154  | 6/13/95  | Borodovsky                | 430   | 5              | 12/10/93    |
|                                                                   | 5,447,810  | 9/5/95   | Chen, et al.              | 430   | 5              | 2/9/94      |
|                                                                   | 5,498,579  | 3/12/96  | Borodovsky, et al.        | 437   | 250            | 6/8/94      |
|                                                                   | 5,523,186  | 6/4/96   | Lin, et al.               | 430   | 5              | 12/16/94    |
|                                                                   | 5,532,090  | 7/2/96   | Borodovsky                | 430   | 5              | 3/1/95      |
|                                                                   | 5,538,815  | 7/23/96  | Oi, et al.                | 430   | 5              | 9/14/93     |
|                                                                   | 5,553,273  | 9/3/96   | Liebmann                  | 395   | 500            | 4/17/95     |
| EXAMINER                                                          |            |          | DATE CONSIDERED           |       |                |             |

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|                                                                   |            |          | FILING DATE 9/9/2003      |       | GROUP unknown  |             |
| <b>U.S. PATENT DOCUMENTS</b>                                      |            |          |                           |       |                |             |
| EXAMINER'S<br>INITIALS                                            | PATENT NO. | DATE     | NAME                      | CLASS | SUBCLASS       | FILING DATE |
|                                                                   | 5,553,274  | 9/3/96   | Liebmann                  | 395   | 500            | 6/6/95      |
|                                                                   | 5,573,890  | 11/12/96 | Spence                    | 430   | 311            | 7/18/94     |
|                                                                   | 5,595,843  | 1/21/97  | Dao                       | 430   | 5              | 3/30/95     |
|                                                                   | 5,620,816  | 4/15/97  | Dao                       | 430   | 5              | 10/13/95    |
|                                                                   | 5,631,110  | 5/20/97  | Shioiri, et al.           | 430   | 5              | 6/5/95      |
|                                                                   | 5,635,316  | 6/3/97   | Dao                       | 430   | 5              | 10/13/95    |
|                                                                   | 5,636,002  | 6/3/97   | Garofalo                  | 355   | 53             | 10/31/95    |
|                                                                   | 5,657,235  | 8/12/97  | Liebmann, et al.          | 364   | 474.24         | 5/3/95      |
|                                                                   | 5,663,017  | 9/2/97   | Schinella, et al.         | 430   | 5              | 6/7/95      |
|                                                                   | 5,663,893  | 9/2/97   | Wampler, et al.           | 364   | 491            | 5/3/95      |
|                                                                   | 5,702,848  | 12/30/97 | Spence                    | 430   | 5              | 8/23/96     |
|                                                                   | 5,705,301  | 1/6/98   | Garza, et al.             | 430   | 5              | 2/27/96     |
|                                                                   | 5,707,765  | 1/13/98  | Chen                      | 430   | 5              | 5/28/96     |
|                                                                   | 5,723,233  | 3/3/98   | Garza, et al.             | 430   | 5              | 2/27/96     |
|                                                                   | 5,740,068  | 4/14/98  | Liebmann, et al.          | 364   | 489            | 5/30/96     |
|                                                                   | 5,761,075  | 6/2/98   | Oi, et al.                | 364   | 488            | 5/31/96     |
|                                                                   | 5,766,804  | 6/16/98  | Spence                    | 430   | 5              | 8/23/96     |
|                                                                   | 5,766,806  | 6/16/98  | Spence                    | 430   | 5              | 9/9/96      |
|                                                                   | 5,807,649  | 9/15/98  | Liebmann, et al.          | 430   | 5              | 10/31/96    |
|                                                                   | 5,815,685  | 9/29/98  | Kamon                     | 395   | 500            | 9/15/95     |
|                                                                   | 5,821,014  | 10/13/98 | Chen, et al.              | 430   | 5              | 2/28/97     |
|                                                                   | 5,825,647  | 10/20/98 | Tsudaka                   | 364   | 167.03         | 3/12/96     |
|                                                                   | 5,827,623  | 10/27/98 | Ishida, et al.            | 430   | 5              | 10/30/96    |
|                                                                   | 5,847,959  | 12/8/98  | Veneklasen, et al.        | 364   | 468.28         | 1/28/97     |
| EXAMINER                                                          |            |          | DATE CONSIDERED           |       |                |             |

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|                                                                   |            |          | APPLICANT Pierrat, et al. |       |                |             |
|                                                                   |            |          | FILING DATE 9/9/2003      |       | GROUP unknown  |             |
| <b>U.S. PATENT DOCUMENTS</b>                                      |            |          |                           |       |                |             |
| EXAMINER'S<br>INITIALS                                            | PATENT NO. | DATE     | NAME                      | CLASS | SUBCLASS       | FILING DATE |
|                                                                   | 5,858,580  | 1/12/99  | Wang, et al.              | 430   | 5              | 9/17/97     |
|                                                                   | 5,862,058  | 1/19/99  | Samuels, et al.           | 364   | 491            | 5/16/96     |
|                                                                   | 5,863,682  | 1/26/99  | Abe, et al.               | 430   | 30             | 2/21/97     |
|                                                                   | 5,879,844  | 3/9/99   | Yamamoto, et al.          | 430   | 30             | 12/20/96    |
|                                                                   | 5,885,734  | 3/23/99  | Pierrat, et al.           | 430   | 5              | 8/15/96     |
|                                                                   | 5,900,338  | 5/4/99   | Garza, et al.             | 430   | 5              | 8/15/97     |
|                                                                   | 5,923,566  | 6/13/99  | Galan, et al.             | 364   | 489            | 3/25/97     |
|                                                                   | 5,994,002  | 11/30/99 | Matsuoka                  | 430   | 5              | 9/4/97      |
|                                                                   | 6,077,310  | 6/20/00  | Yamamoto, et al.          | 716   | 19             | 1/29/99     |
|                                                                   | 6,078,738  | 6/20/00  | Garza, et al.             | 395   | 500.22         | 5/8/97      |
|                                                                   | 6,081,658  | 6/27/00  | Rieger, et al.            | 395   | 500.22         | 12/31/97    |
|                                                                   | 6,083,275  | 7/4/00   | Heng, et al.              | 716   | 19             | 1/9/98      |
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|                                                                   |            |         | NTI-007-1D                |       | Filed Herewith |                          |                          |
|                                                                   |            |         | APPLICANT Pierrat, et al. |       |                |                          |                          |
|                                                                   |            |         | FILING DATE 9/9/2003      |       | GROUP unknown  |                          |                          |
| <b>FOREIGN PATENT DOCUMENTS</b>                                   |            |         |                           |       |                |                          |                          |
| EXAMINER'S<br>INITIALS                                            | PATENT NO. | DATE    | COUNTRY                   | CLASS | SUBCLASS       | TRANSLATION              |                          |
|                                                                   |            |         |                           |       |                | YES                      | NO                       |
|                                                                   | 0 698 821  | 2/28/96 | EPO                       |       |                | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                   | 2,638,561  | 4/25/97 | JP                        |       |                | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                   | 2,650,962  | 5/16/97 | JP                        |       |                | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                   | 3-210560   | 9/13/91 | JP                        |       |                | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                   | 7-111528   | 2/14/91 | JP                        |       |                | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                   | 8-236317   | 9/6/96  | JP                        |       |                | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                   | 8-51068    | 2/20/96 | JP                        |       |                | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                   | 10-133356  | 5/22/98 | JP                        |       |                | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                   | 11-143085  | 5/28/99 | JP                        |       |                | <input type="checkbox"/> | <input type="checkbox"/> |
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| <b>INFORMATION DISCLOSURE<br/>CITATION</b><br><br><b>PTO-1449</b>             | ATTY. DOCKET NO.                                                                                                                                                                                            | SERIAL NO.      |
|                                                                               | NTI-007-1D                                                                                                                                                                                                  | Filed Herewith  |
|                                                                               | APPLICANT Pierrat, et al.                                                                                                                                                                                   |                 |
|                                                                               | FILING DATE 9/9/2003                                                                                                                                                                                        | GROUP unknown   |
| <b>OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)</b> |                                                                                                                                                                                                             |                 |
|                                                                               | Ackmann, P. et al., "Phase Shifting And Optical Proximity Corrections To Improve CD Control On Logic Devices In Manufacturing For Sub 0.35 $\mu$ m I-Line", Advance Micro Devices (8 pages).                |                 |
|                                                                               | Asai, S. et al., "High Performance Optical Lithography Using A Separated Light Source", <i>J. Vac. Sci. Technol. B</i> , Vol. 10, No. 6, pp. 3023-3026, November/December 1992.                             |                 |
|                                                                               | Asai, N. et al., "Proposal For The Coma Aberration Dependent Overlay Error Compensation Technology", <i>Jpn. J. Appl. Phys.</i> , Vol. 37, pp. 6718-6722 (1998).                                            |                 |
|                                                                               | Barouch, E. et al., "OPTIMASK: An OPC Algorithm For Chrome And Phase-Shift Mask Design", <i>SPIE</i> , Vol. 2440, pp. 192-206, February 1995.                                                               |                 |
|                                                                               | Brunner, T. et al., "170nm Gates Fabricated By Phase-Shift Mask And Top Anti-Reflector Process", <i>SPIE</i> , Optical/Laser Microlithography VI, Vol. 1927, pp. 182-189 (1993).                            |                 |
|                                                                               | Brunner, T., "Rim Phase-Shift Mask Combined With Off-Axis Illumination: A Path To 0.5 $\lambda$ /Numerical Aperture Geometries", <i>Optical Engineering</i> , Vol. 32, No. 10, pp. 2337-2343, October 1993. |                 |
|                                                                               | Chen, J.F. et al., "Full-Chip Optical Proximity Correction With Depth Of Focus Enhancement", <i>Microlithography World</i> (1997).                                                                          |                 |
|                                                                               | Chen, J.F. et al., "Optical Proximity Correction For Intermediate-Pitch Features Using Sub-Resolution Scattering Bars", MicroUnity Systems Engineering, Inc., Sunnyvale, California, pp. 1-16.              |                 |
|                                                                               | Chen, J.F., et al., "Practical Method For Full-Chip Optical Proximity Correction", MicroUnity Systems Engineering, Inc., Sunnyvale, California (14 pages).                                                  |                 |
|                                                                               | Cobb, et al., "Fast Sparse Aerial Image Calculation For OPC", <i>SPIE</i> , Vol. 2621, pp. 534-544.                                                                                                         |                 |
| EXAMINER                                                                      |                                                                                                                                                                                                             | DATE CONSIDERED |

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|                                                                               | <b>APPLICANT</b> Pierrat, et al.                                                                                                                                                                                                                       |                                     |
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|                                                                               | APPLICANT Pierrat, et al.                                                                                                                                                                                                         |                              |
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|                                                                   |                   |             | <b>Applicant</b><br>PIERRAT, Christophe |              | <b>Group</b><br>unknown             |                        |
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